

REMARKS

The above amendments and the following remarks are fully and completely responsive to the Office Action dated April 14, 2003. By this amendment, claims 1 and 2 have been canceled and the subject matter incorporated into claim 3. Claim 3 is now in independent form. Claims 3, 5 and 12 have been amended to or more clearly claim the invention. Claim 4 has merely been amended to depend from claim 3. No new matter has been entered. Accordingly, claims 3-12 are pending and presented for reconsideration.

Applicants respectfully acknowledge the courtesies extended to Applicants' representative by Supervisory Primary Examiner (SPE) Gutierrez and Examiner De Jesus during the July 30, 2003 interview. The points discussed during the interview are incorporated herein. During the interview, SPE Gutierrez and Examiner De Jesus suggested amending the claims to include the limitation that the tool of the machining tool and the probe of the coordinate-measuring machine are orthogonal to each other in order to overcome the outstanding prior art rejections. By this amendment, the Applicants have amended the claims accordingly.

Claims 1-8 and 12 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Osburn et al. (U.S. Patent No. 3,825,245, "Osburn") in view of Matsumiya et al. (U.S. Patent No. 5,291,662, "Matsumiya"). The Office Action took the position that Osburn discloses all the limitations of the claimed invention, except for a coordinate-measuring device for bringing a probe thereof close to the work in the waiting position of the auto pallet changer, directly after the work is machined by the machining tool and placed on the waiting position, to thereby measure the forms and dimensions of the

work. Matsumiya is cited for teaching this limitation. By this Amendment, claims 1 and 2 have been canceled and the subject matter incorporated into claim 3. Therefore, the rejection with respect to claims 1 and 2 is moot. However, Applicants submit that claims 3-8 and 12 recite subject matter that is neither taught nor suggested by any combination of the prior art.

Applicants' amended claim 3 recites a work form-measuring method including the steps of: placing a work on a waiting position of an auto pallet changer directly after the work has been machined by a machining tool; bringing a probe of a coordinate-measuring machine close to the work in the waiting position of the auto pallet changer and then measuring the forms and dimensions of the work, the coordinate-measuring machine being arranged in the vicinity of the machining tool; and moving the tool of the machining tool and the probe of the coordinate-measuring machine to the work in a horizontal direction of motion and orthogonal to each other.

Applicants' amended claim 5 recites a work form-measuring apparatus including an auto pallet changer for moving a work between a waiting position and a machining position at an inlet of a machining tool. A coordinate-measuring machine is provided for bringing a probe thereof close to the work in the waiting position of the auto pallet changer directly after the work has been machined by the machining tool and placed on the waiting position, to thereby measure the forms and dimensions of the work. The tool of the machining tool and the probe of the coordinate-measuring machine move toward the work in a horizontal direction of motion and orthogonal to each other.

Applicants' amended claim 12 recites a coordinate-measuring machine disposed in the vicinity of a machining tool for getting a probe thereof close to a work in a waiting

position of an auto pallet changer directly after the work has been machined by the machining tool and placed on the waiting position, to thereby measure the forms and dimensions of the work. The tool of the machining tool and the probe of the coordinate-measuring machine move toward the work in a horizontal direction of motion and orthogonal to each other.

The Office Action took the position that the combination of the prior art discloses all the elements of the claimed invention. However, it is respectfully submitted that the prior art fails to disclose or suggest the claimed invention, and therefore, fails to provide the steps, the structure, and the advantages that are provided by the present invention. For example, the present invention provides for placing a work on a waiting position of an auto pallet changer directly after the work is machined by a machining tool. Thereafter, a probe is brought of a coordinate-measuring machine close to the work in the waiting position of the auto pallet changer and then the forms and dimensions of the work are measured. The coordinate-measuring machine is arranged in the vicinity of the machining tool. This provides a work form measuring method and device which are capable of shortening the production line, including the measurement, as discussed generally in Applicants' specification.

In the present invention a horizontal type three-dimensional coordinate measuring machine is connected to a make-ready area (waiting position) of a machining center. The machining center has an auto pallet changer and is located at a transfer area with a linear pallet pool in line machines.

Osburn discloses a workpiece changer mechanism for a machine tool. As shown in Fig. 1, the machine includes a horizontal grid 20, machine table 24, supporting power

table 27 and a work carrying pallet 30 releasably clamped to the pallet table 27 for selective indexable movement therewith. To perform machine operation on the workpiece secured to the pallet 30, a milling cutter carried by tool spindle 40 is selectively movable by affecting relative bodily movement between spindle 40 and pallet 30. Motor 42 is operative to effect X-axis movement of the table 24 and work pallet 30 and moves table 24 to a rightward limit of X-axis movement in preparation for a work or pallet changing operation. Work changer 44 includes a machine base 45, index table 46 rotatably supported by the base, and pallet support 47 carried by the index table for 180° indexable movement.

To begin machining, pallet 30 is clamped in the machining station 31 and supports an incomplete machined workpiece. Pallet arm 55 is maintained in a hydraulically retracted empty position shown in Fig. 9. After machining is completed, the empty pallet arm 55 is extensibly advanced outwardly into positive latch engagement with pallet 30 and then reversibly retracted inwardly with the pallet 30 and the now completely machined workpiece carried thereby.

Matsumiya discloses a three-dimensional measuring machine. As shown in Fig. 14, machine 201 is mounted on movable carriage 211. Carriage 211 is positioned adjoining bed 216. Carriage 211 is designed such that the object to be machined can be measured directly at the machining site.

However, the spindle of the three-dimensional coordinate measuring machine is vertically driven in Matsumiya, whereas the spindle of the three-dimensional coordinate measuring machine of the present invention is horizontally driven.

Furthermore, although the machine tool and the three-dimensional coordinate measuring machine of Matsumiya are disposed so as to face each other, in the present invention, the machine tool and the three-dimensional coordinate measuring machine are disposed adjacent to each other so that the orientations of the respective spindles thereof, which are horizontally driven, become orthogonal to each other. Thus, effective utilization of space can be further improved, and an advantage such as quick commencement of measurement with respect to the work after machining is made possible.

Assuming *arguendo* that the references are combined as suggested, in an independent machining center, the make-ready area is only an area where an operator removes a machined work and mounts a new material. Thus, even if the construction by which measurement is carried out in a machining area, as in Fig. 14 of Matsumiya, is combined with Osburn, the combination would still fail to disclose or suggest the claimed invention.

In sum, Applicants submit that Osburn and Matsumiya, either alone or in combination, fail to disclose or suggest moving the tool of the machining tool in the probe of the coordinate-measuring machine to the work in a horizontal direction of motion and orthogonal to each other, as recited in Applicants' amended claim 3.

Furthermore, the combination of Osburn and Matsumiya fails to disclose or suggest wherein the tool of the machining tool and the probe of the coordinate-measuring machine move towards the work in a horizontal direction of motion and orthogonal to each other, as recited in Applicants' amended claims 5 and 12.

Thus, it is respectfully submitted that Applicants' invention, as set forth in claims 3, 5 and 12, is not obvious within the meaning of 35 U.S.C. § 103.

As claim 4 depends from claim 3 and claims 6-8 depend from claim 5, Applicants respectfully submit that each of these claims incorporate the patentable aspects thereof and are therefore allowable for at least the same reasons as discussed above.

Claims 3, 6-7 and 11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Osburn in view of Matsumiya as applied to claims 1-8 and 12, and further in view of DE004126532 A1 ("DE '532"). In making this rejection, the Office Action took the position that Osburn, as modified by Matsumiya, discloses all the elements of the claimed invention, except for a probe having a horizontal direction of motion, a refuge means, and a rotating means. DE '532 was cited for disclosing these limitations.

However, as will be discussed below, Applicants respectfully submit that claims 3, 6-7 and 11 recite subject matter neither disclosed nor suggested in any combination of the prior art.

DE '532 discloses a three-dimensional coordinate-measuring apparatus for workpieces. As discussed in the Abstract of DE '532, the coordinate measurement arrangement contains a horizontal coordinate reference surface for a measurement transducer with a vertically movable sensing arm and sensor.

However, as stated above, the combination of Osburn and Matsumiya fails to disclose or suggest the claimed invention. DE '532 fails to rectify these deficiencies.

Therefore, Applicants respectfully submit that Osburn, as modified by Matsumiya and further modified by DE '532 fails to disclose or suggest moving the tool of the

machining tool and the probe of the coordinate-measuring machine to the work in a horizontal direction of motion and orthogonal to each other, as recited in Applicants' amended claim 3.

Therefore, it is respectfully submitted that the Applicants' invention, as set forth in claim 3, is not obvious within the meaning of 35 U.S.C. § 103.

Furthermore, because claims 6, 7 and 11 are dependent upon claim 5, Applicants submit that each of these claims recite subject matter that is neither disclosed nor suggested by the cited prior art for at least the reasons set forth above with respect to the independent claim.

Claim 9 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Osburn in view of Matsumiya as applied to claims 1-8 and 12 above, and further in view of Yoshida (U.S. Patent No. 4,473,883). In making this rejection, the Office Action took the position that Osburn, as modified by Matsumiya, discloses all the elements of the claimed invention, except for the machining tool and coordinate measuring means mutually exchanging a measurement enabling signal and a measurement completion signal, both of which are related to the movement of the work by the changer. Yoshida was cited for disclosing this limitation.

Yoshida discloses a machining system and control system therefore. This system includes a pallet magazine 11 on which a plurality of pallets PA are carried, with each pallet PA being carried on a pallet table. Pallet changers APC1 and APC2 are located near pallet magazine 11. Yoshida teaches using a coordinate-measuring machine MUNT to measure the work in a waiting position of an auto pallet changer APC4 and then measuring the form and dimension of the work.

However, as discussed above, the combination of Osburn and Matsumiya fails to disclose or suggest the claimed invention. Yoshida fails to rectify their deficiencies. Therefore, Applicants submit that Osburn, Matsumiya and Yoshida, either alone or in combination, fail to disclose or suggest the claimed invention.

Thus, Applicants respectfully request that the rejection be withdrawn.

Claims 9 and 10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Osburn in view of Matsumiya and also in view of DE '532 as applied to claims 3, 6-7 and 11 above, further in view of Yoshida.

However, as discussed above, the combination of prior art fails to disclose or suggest the claimed invention. Therefore, Applicants respectfully request that the rejection be withdrawn.

CONCLUSION

Applicants submit that the application is now in condition for allowance. If the Examiner believes the application is not in condition for allowance, Applicants respectfully request that the Examiner contact the undersigned attorney by telephone, if it is believed that such contact will expedite the prosecution of the application.

The Commissioner is authorized to charge payment for any additional fees which may be required with respect to this paper to Deposit Account No. 01-2300, referencing Attorney Docket No. 107292-09003.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Lynne D. Anderson". The signature is fluid and cursive, with the first name "Lynne" and last name "Anderson" clearly distinguishable.

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Enclosure: Petition for Extension of Time (one month)